Cumulative Time in Band (cTIB): Glycemic Level, Variability and Patient Outcome All in 1

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Introduction: Safe, effective glycemic control (GC) can improve outcomes, but is difficult to achieve consistently. Glycemic level and variability are independently associated with mortality. Patho-physiologically, the negative outcomes of dysglycemia are associated with exposure and repetition to high glucose levels, indicating that metrics of exposure might accurately capture outcome.

Objectives: To determine the cumulative time in band (cTIB) thresholds associated with improved outcomes for achieving intermediate levels of GC (4.0-7.0 mmol/L, 5.0-8.0mmol/L and 4.0-8.0mmol/L).

Method: Retrospective analysis of patient data (N=1717) from the SPRINT (N=784) before-after study and the Glucontrol (N=933) randomized clinical trial. cTIB is defined as the percentage of blood glucose from start to the present day within the specified band. It is evaluated daily for the 4.0-7.0mmol/L, 5.0-8.0mmol/L and 4.0-8.0mmol/L bands, with thresholds (t = 50%, 60%, 70%, 80%) for all patients. The odds ratio (OR) is calculated for cTIB≥t versus cTIB<t, including 95% CI for each day 1-14.

Results: The table shows OR range for days 1-14. For all glycemic bands and all thresholds t, OR > 1.0 for all days, except day 1.

	$t = 50\%$	$t = 60\%$	$t = 70\%$	$t = 80\%$
4.0-7.0mmol/L band	1.10-1.42	1.07-1.98	1.08-2.35	1.18-3.76
5.0-8.0mmol/L band	1.14-1.34	0.98-1.65	0.98-2.39	1.07-1.70
4.0-8.0mmol/L band	1.04-1.28	1.00-1.54	0.96-1.65	0.91-2.28

The lower bound of the 95%CI over days 1-10 where patient data is greatest is:

	$t = 50\%$	$t = 60\%$	$t = 70\%$	$t = 80\%$
4.0-7.0mmol/L band	0.85-0.96	0.82-1.12	0.81-1.56	0.84-1.67
5.0-8.0mmol/L band	0.89-0.88	0.76-0.89	0.74-1.02	0.78-0.90
4.0-8.0mmol/L band	0.80-0.82	0.78-0.81	0.74-0.98	0.70-1.10

Conclusion: Results show that for cTIB in the 4.0-7.0mmol/L band high cTIB is associated with increasingly lower mortality over days 1-14 and the 95%CI is increasingly above 1.0 over time. The 4.0-8.0mmol/L and 5.0-8.0mmol/L bands had significantly reduced benefit and confidence in comparison. This suggests that tighter GC positively influences patient outcome if control is maintained and exposure to glycemia outside 4.0-7.0mmol/L is limited. cTIB is readily calculated and can be used to continuously assess quality of control during a patient's stay unlike other metrics and analyses, which require a full patient stay of data.